REMARKS

Claims 1-33 are pending in the present patent application. Claims 1-33 stand rejected. By this Amendment, claims 18-20 have been amended. This application continues to include claims 1-33.

Applicants have amended claims 18-20 in order to correct inadvertent typographical errors. Applicants respectfully submit that the amendment of claims 18-20 does not introduce new subject matter to the present application.

Claims 1-23 and 26-33 were rejected under 35 U.S.C. §102(b) as being anticipated by over Miquel, et al., U.S. Patent No. 6,565,171 B2 (hereinafter, Miquel). Applicants respectfully request reconsideration of the rejection of claims 1-23 and 26-33 in view of the following.

Miquel is directed to reducing vertical banding (col. 1, line 8). Miquel discloses generally that the operation of a voltage receiving component creates a temporal frequency caused by its vibration, that the carriage oscillates at a certain rate as it performs its printing pass (col. 4, lines 40-44), and that by altering the temporal frequency of the voltage receiving component and/or the carriage speed at certain times during the printing operation, the spatial frequencies at which the delays or events occur may be spread out to as to prevent the accumulation that results in vertical banding (col. 4, lines 59-65). By varying the voltage of the voltage receiving component, for example, the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49). In addition, by varying the carriage speed, the temporal vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48). Both the voltage supplied to the voltage receiving component and the speed of the carriage may be varied by a small

amount without substantially affecting the effectiveness of the voltage receiving component and the throughput, although only one of the supplied voltage and the carriage speed may be varied in order to reduce vertical banding (col. 8, lines 53-65).

Applicants believe that claims 1-23 and 26-33 patentably define Applicants' invention over Miquel, for at least the reasons set forth below.

Claim 1 is directed to a method for reducing the effects of printhead carrier disturbance during printing with an imaging apparatus having a printhead carrier for carrying at least one printhead. Claim 1 recites accelerating said printhead carrier from a first position in a first direction; printing with said printhead in said first direction; and changing a rate of acceleration of said printhead carrier for a subsequent accelerating of said printhead carrier from said first position in said first direction prior to a subsequent printing with said printhead in said first direction to phase shift said printhead carrier disturbance.

In contrast to accelerating the printhead carrier, printing, and changing the rate of acceleration of the printhead carrier for a subsequent accelerating of the printhead carrier, as recited in claim 1, Miquel discloses changing either the voltage supplied to a voltage receiving component (col. 7, lines 4-49), changing the carriage speed as between passes, so that the carriage speed is different for each pass, to control the temporal vibrations caused by the voltage receiving component (col. 8, lines 38-48, Fig. 5, steps 506 to 522), or both, in order to reduce vertical banding (col. 8, lines 53-65).

However, nowhere does Miquel disclose, teach, or suggest changing the acceleration of the printhead carrier, much less accelerating said printhead carrier from a first position in a first direction; printing with the printhead in the first direction; and changing a rate of acceleration of the printhead carrier for a subsequent accelerating of the printhead carrier from

the first position in the first direction prior to a subsequent printing with the printhead in the first direction to phase shift the printhead carrier disturbance, as recited in claim 1. It is well known in the art that changing a carriage speed does not disclose, teach, or suggest changing a carriage acceleration, since speed and acceleration are different physical quantities. For example, it is known in the art that speed is given by units of length divided by units of time, whereas acceleration is given by units of length divided by the square of units of time, i.e., acceleration is the rate of change of velocity with respect to time, and is not velocity.

Although Miquel discloses changing the carriage speed as between passes so that the carriage speed is different for each pass (col. 8, lines 38-48, Fig. 5, steps 506 to 522), this does not disclose, teach, or suggest a change in acceleration of the carriage as between passes. As set forth above, acceleration is not the same physical quantity as velocity.

In addition, Miquel does not disclose, teach, or suggest a phase shift of the printhead carrier disturbance, as recited in claim 1. Nonetheless, the Examiner asserts an interpretation of the phrase, "phase shift" as meaning that "the disturbance is spread out during the printing pass instead of being concentrated in certain areas because of the native frequency of the carriage. . . ." In contrast to spreading out a disturbance, the term "phase shift" has a well known meaning within the art, and describes the shifting of the phase of a vibration, that is, changing the spatial or temporal location of a wave of a certain vibratory frequency, not changing the frequency of a vibration, which is what spreading out a disturbance amounts to.

For example, and without intent to limit Applicants claimed invention, Applicants' Figs. 5A-5E illustrate four spatially phase shifted printhead carrier disturbance waveforms, with the phase shifts being attributable to using four different rates of acceleration for a printhead carrier from a carrier start position in four successive printhead passes in the same

direction (see Applicants' specification at page 4, lines 21-25). The four individual phase-shifted waveforms are illustrated in Figs. 5A-5D, whereas Fig. 5E illustrates the four waveforms superimposed (see Applicants' specification at page 8, line 29 to page 9, line 11), which illustrates the phase shift between one waveform and the next. It is clear from Applicants' Figs. 5A-5E that the waveforms have the same frequency, but a different phase, e.g., a different location on the abscissa of Figs. 5A-5E, and hence are "phase shifted," but not spread out during the printing pass, since the frequency of each waveform is clearly the same.

In contrast to phase shifting a printhead carrier disturbance, Miquel discloses changing the frequency of the disturbance. For example, Miquel discloses that by altering the temporal frequency of the voltage receiving component and/or changing the carriage speed by using a different carriage speed for different passes during the printing operation, the spatial frequencies at which the delays or events occur may be spread out to as to prevent the accumulation that results in vertical banding (col. 4, lines 59-65, Fig. 5, steps 506-522). By varying the voltage of the voltage receiving component, for example, the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49 generally, in particular col. 7, lines 42-46). In addition, by varying the carriage speed, the temporal vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48).

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel does not disclose, teach, or suggest the subject matter of claim 1. Accordingly, claim 1 is believed allowable in its present form.

Claims 2-7 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 1. In addition, claims 2-6 further and patentably define the invention over Miquel.

For example, claim 2 is directed to the method of claim 1, said rate of acceleration being determined based on a frequency of said printhead carrier disturbance. In contrast to a rate of acceleration being determined based on a frequency of said printhead carrier disturbance, Miquel discloses that the frequency of the carrier disturbance, which is caused by a voltage receiving component (col. 4, lines 40-47), is changed by changing the voltage supplied to the voltage receiving component, and along with changes to the carriage speed, prevents spatial frequencies from accumulating and resulting in vertical banding (col. 4, lines 59-65).

Accordingly, claim 2 is believed allowable in its own right.

Claim 4 is directed to the method of claim 1, wherein said rate of acceleration for said subsequent accelerating of said printhead carrier is greater than a previous rate of acceleration of said printhead carrier. Since Miquel does not disclose, teach, or suggest changing the rate of acceleration, as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest wherein the rate of acceleration for the subsequent accelerating of the printhead carrier is greater than a previous rate of acceleration of the printhead carrier, as recited in claim 4.

Although the Examiner relies on Miquel at column 8, lines 1-25 in support of the proposition that Miquel teaches that the rate of acceleration can be greater or lesser than a previous acceleration, Applicants respectfully submit that Miquel at column 8, lines 1-25 teaches that the carriage speeds may vary, but does not even mention acceleration, and

accordingly, does not disclose, teach, or suggest that the rate of acceleration can be greater or lesser than a previous acceleration, much less as recited in claim 4.

Accordingly, claim 4 is believed allowable in its own right.

Claim 5 is directed to the method of claim 1, wherein said rate of acceleration for said subsequent accelerating of said printhead carrier is less than a previous rate of acceleration of said printhead carrier. Since Miquel does not disclose, teach, or suggest changing the rate of acceleration, as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest wherein the rate of acceleration for the subsequent accelerating of the printhead carrier is less than a previous rate of acceleration of the printhead carrier, as recited in claim 5.

Although the Examiner relies on Miquel at column 8, lines 1-25 in support of the proposition that Miquel teaches that the rate of acceleration can be greater or lesser than a previous acceleration, Applicants respectfully submit that Miquel at column 8, lines 1-25 teaches that the carriage speeds may vary, but does not even mention acceleration, and accordingly, does not disclose, teach, or suggest that the rate of acceleration can be greater or lesser than a previous acceleration, much less as recited in claim 5.

Accordingly, claim 5 is believed allowable in its own right.

Claim 8 is directed to a method for reducing the effects of printhead carrier disturbance during printing with an imaging apparatus having a printhead carrier for carrying at least one printhead. Claim 8 recites, in part, on a present pass of said printhead across a print medium, accelerating said printhead carrier from a first position in a first direction at a first rate of acceleration; printing with said printhead on said present pass; and on a subsequent pass of said printhead across said print medium, accelerating said printhead carrier from said first position in said first direction at a second rate of acceleration different from

said first rate of acceleration. For substantially the same reasons as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest accelerating the printhead carrier from a first position in a first direction at a first rate of acceleration; printing with the printhead on the present pass; and on a subsequent pass of the printhead across the print medium, accelerating the printhead carrier from the first position in the first direction at a second rate of acceleration different from the first rate of acceleration, as recited in claim 8. For example, Miquel does not disclose, teach, or suggest varying the rate of acceleration of the carriage, but rather, discloses varying the voltage of the voltage receiving component, wherein the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49), and varying the carriage speed, so that the temporal vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48).

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel does not disclose, teach, or suggest the subject matter of claim 8. Accordingly, claim 8 is believed allowable in its present form.

Claims 9-14 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 8. In addition, claims 9-14 further and patentably define the invention over Miquel.

For example, claim 9 is directed to the method of claim 8, selecting said first rate of acceleration and said second rate of acceleration to phase shift said printhead carrier disturbance. Miquel does not disclose, teach, or suggest selecting the first rate of acceleration and the second rate of acceleration to phase shift the printhead carrier disturbance for substantially the same reasons as set forth above with respect to claim 1.

Claim 10 is directed to the method of claim 8, said first rate of acceleration and said second rate of acceleration being determined based on a frequency of said printhead carrier disturbance. Claim 10 is believed allowable in its own right for substantially the same reasons as set forth above with respect to claim 2.

Claim 12 is directed to the method of claim 8, wherein said second rate of acceleration is greater than said first rate of acceleration. Claim 12 is believed allowable in its own right for substantially the same reasons as set forth above with respect to claim 4.

Claim 13 is directed to the method of claim 8, wherein said second rate of acceleration is less than said first rate of acceleration. Claim 12 is believed allowable in its own right for substantially the same reasons as set forth above with respect to claim 5.

Claim 15 is directed to a method for reducing the effects of printhead carrier disturbance during printing with an imaging apparatus having a printhead carrier for carrying at least one printhead. Claim 15 recites, in part, defining a printable region for printing on a print medium, said printable region having a print start position and a print end position, said print start position and said print end position defining an extent of said printable region in a main scanning direction of said printhead carrier; defining a carrier start position outside said printable region; on a present pass of said printhead across said print medium, accelerating said printhead carrier from said carrier start position in a first direction toward said print start position at a first rate of acceleration. Although Miquel generally discloses printing, in contrast to claim 15, Miquel simply does not disclose, teach, or suggest where a printable region may be or what any extents of such a printable region may be, where a print start position may be located, and does not disclose, teach, or suggest that a carrier start position is outside of the printable region, much less as recited in claim 15.

In addition, Miquel does not disclose, teach, or suggest on a subsequent pass of the printhead across the print medium, accelerating the printhead carrier from the carrier start position in said the direction toward the print start position at a second rate of acceleration different from the first rate of acceleration, as also recited in claim 15, since Miquel does not disclose, teach, or suggest varying the rate of acceleration of the carriage. Rather, Miquel discloses varying the voltage of the voltage receiving component, wherein, for example, the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49), and varying the carriage speed, so that the temporal vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48).

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel does not disclose, teach, or suggest the subject matter of claim 15. Accordingly, claim 15 is believed allowable in its present form.

Claims 16-20 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 15. In addition, claims 16-20 further and patentably define the invention over Miquel.

For example, claim 17 is directed to the method of claim 15. Claim 17 recites, in part, determining a frequency of said printhead carrier disturbance. Although Miquel discloses that controller 404 may control the speed of the voltage receiving component by controlling the voltage supplied by the power source (col. 6, lines 2-6), Miquel simply does not disclose, teach, or suggest determining a frequency of the printhead carrier disturbance. Rather, Miquel discloses that the voltage receiving component may vibrate, causing dot placement errors (col. 6, lines 60-67), and that the corresponding level of vertical banding may be reduced by

varying the voltage supplied to the voltage receiving component, and by varying the speed of printhead 414 (col. 8, lines 53-65). Thus, Miquel seeks to vary the frequency of vibration induced by the voltage receiving component, and to vary the speed of the printhead to alter the dot placement errors so as to reduce vertical banding, but Miquel does so without determining a frequency of the printhead carrier disturbance, as recited in claim 17.

Claim 17 also recites, in part, said first rate of acceleration and said second rate of acceleration being determined based on said frequency of said printhead carrier disturbance to phase shift said printhead carrier disturbance. For substantially the same reasons as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest wherein the first rate of acceleration and the second rate of acceleration are determined based on the frequency of the printhead carrier disturbance to phase shift the printhead carrier disturbance.

Accordingly, claim 17 is believed allowable in its own right.

Claim 21 is directed to an imaging apparatus. Claim 21 recites, among other things, on a present pass of said printhead across said print medium, accelerating said printhead carrier from a first position in a first direction at a first rate of acceleration; printing with said printhead on said present pass; on a subsequent pass of said printhead across said print medium, accelerating said printhead carrier from said first position in said first direction at a second rate of acceleration different from said first rate of acceleration. For substantially the same reasons as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest accelerating the printhead carrier from a first position in a first direction at a first rate of acceleration; printing with the printhead on the present pass; on a subsequent pass of the printhead across the print medium, accelerating the printhead carrier from the first position in the first direction at a second rate of acceleration different from the first rate of acceleration,

as recited in claim 21, since Miquel does not disclose, teach, or suggest varying the rate of acceleration of the carriage. Rather, Miquel discloses varying the voltage of the voltage receiving component, wherein, for example, the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49), and varying the carriage speed, so that the temporal vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48).

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel does not disclose, teach, or suggest the subject matter of claim 21. Claim 21 is thus believed allowable in its present form.

Claims 22, 23, and 26-33 are believed allowable due to their dependence, directly or indirectly, on otherwise allowable base claim 21. In addition, claims 22, 23, and 26-33 further and patentably define the invention over Miquel.

For example, Claim 23 is directed to the imaging apparatus of claim 21, said controller executing instructions to perform the step of selecting said first rate of acceleration and said second rate of acceleration to phase shift a printhead carrier disturbance. For substantially the same reasons as set forth above with respect to claim 1, Miquel does not disclose, teach, or suggest a controller executing instructions to perform the step of selecting the first rate of acceleration and the second rate of acceleration to phase shift a printhead carrier disturbance, as recited in claim 23.

Accordingly, claim 23 is believed allowable in its own right.

Claim 28 is directed to the imaging apparatus of claim 21, wherein said second rate of acceleration is greater than said first rate of acceleration. For substantially the same reasons as set forth above with respect to claim 4, Miquel does not disclose, teach, or suggest wherein

the second rate of acceleration is greater than the first rate of acceleration, as recited in claim 18.

Accordingly, claim 28 is believed allowable in its own right.

Claim 29 is directed to the imaging apparatus of claim 21, wherein said second rate of acceleration is less than said first rate of acceleration. For substantially the same reasons as set forth above with respect to claim 5, Miquel does not disclose, teach, or suggest wherein the second rate of acceleration is less than the first rate of acceleration, as recited in claim 29.

Accordingly, claim 29 is believed allowable in its own right.

Claim 33 is directed to the imaging apparatus of claim 21, wherein the accelerating steps and the printing steps are repeated for a second direction opposite to said first direction. For substantially the same reasons as set forth above with respect to claim 7, Miquel does not disclose, teach, or suggest wherein the accelerating steps and the printing steps are repeated for a second direction opposite to the first direction, as recited in claim 33.

Accordingly, claim 33 is believed allowable in its own right.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit that Miquel does not disclose, teach, or suggest the subject matter of claims 1-23 and 26-33, and thus respectfully request that the rejection of claims 1-23 and 26-33 under 35 U.S.C. 102(b) be withdrawn.

Claims 24 and 25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Miquel, et al. in view of Kanemitsu, U.S. Patent No. 5,547,295. Applicants respectfully request reconsideration of the rejection of claims 24 and 25 in view of the following.

Kanemitsu is directed to a carriage driving method for driving a carriage using a motor (col. 1, lines 11-12). Kanemitsu discloses that a periodic vibration of the carriage in its

moving direction is generated when the carriage in a stopped state starts to move, and the carriage is accelerated to a constant speed while being accompanied by the vibration (col. 1, lines 28-31). In order to minimize the vibration, Kanemitsu discloses that the the acceleration driving range of the motor for driving the carriage is set to a time substantially equal to the half period of the vibration generated in the moving direction of the carriage, and thereafter the driving speed of the carriage driving motor is shifted to the constant-speed range (col. 5, lines 27-31).

Applicants believe that claims 24 and 25 patentably define Applicants' invention over Miquel, for at least the reasons set forth below.

Claims 24 and 25 are believed allowable due to their dependence, indirectly, on otherwise allowable base claim 21.

Notwithstanding the above, claim 24 is directed to the imaging apparatus of claim 23, wherein said phase shift of said printhead carrier disturbance is by one of ¼, ½, and ¾ of a period of said printhead carrier disturbance. For substantially the same reasons as set forth above with respect to claim 1, Applicants submit that Miquel does not disclose, teach, or suggest a phase shift of the printhead carrier disturbance, but rather, discloses changing the frequency of the disturbance. For example, Miquel discloses that by altering the temporal frequency of the voltage receiving component and/or the carriage speed at certain times during the printing operation, the spatial frequencies at which the delays or events occur may be spread out to as to prevent the accumulation that results in vertical banding (col. 4, lines 59-65). By varying the voltage of the voltage receiving component, for example, the frequency of the vibrations caused by its rotation is different than the frequency of rotation during normal operation (col. 7, lines 4-49). In addition, by varying the carriage speed, the temporal

vibrations caused by the voltage receiving component may also be controlled (col. 8, lines 38-48).

The phase shift of the printhead carrier disturbance is by one of ¼, ½, and ¾ of a period of the printhead carrier disturbance, as recited in claim 24, is based on the controller executing instructions to perform the step of selecting the first rate of acceleration and the second rate of acceleration to phase shift the printhead carrier disturbance, as recited in claim 23, from which claim 24 depends, wherein the first rate of acceleration is employed in a present pass of the printhead, and the second rate of acceleration is employed in the subsequent pass of the printhead, as recited in claim 21, from which claims 23 and 34 depend.

In contrast, Kanemitsu does not disclose, teach, or suggest varying an acceleration of the carriage as between passes of the printhead, for example, as might yield a first rate of acceleration in a present pass, and a second rate of acceleration in a subsequent pass. Rather, Kanemitsu merely discloses setting the time of the acceleration to be substantially the same as ½ the period of the vibration, so as to minimize the amplitude of the vibration (col. 4, lines 38-44, and col. 5, lines 27-31). For example, Kanemitsu does not disclose, teach, or suggest selecting a different acceleration for each different pass of the printhead, but rather, generally discloses setting an acceleration that reduces the amplitude of vibration. Since Kanemitsu does not disclose, teach, or suggest a phase shift of the printhead carrier disturbance by one of ¼, ½, and ¾ of a period of the printhead carrier disturbance, as between a present pass of the printhead and a subsequent pass of the printhead, Kanemitsu does not disclose, teach, or suggest wherein the phase shift of the printhead carrier disturbance is by one of ¼, ½, and ¾ of a period of said printhead carrier disturbance, as recited in claim 24, which incorporates by reference the subject matter of both claims 21 and 23 from which claim 24 depends.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel in view of Kanemitsu, taken alone or in combination, does not disclose, teach, or suggest the subject matter of claim 24. Claim 24 is thus believed allowable in its present form.

Claim 25 is directed to the imaging apparatus of claim 23, wherein for four consecutive passes of said printhead across said print medium in said first direction, said phase shift of said printhead carrier disturbance is in the order of 0, ½, ¼, and ¾, respectively, of a period of said printhead carrier disturbance. Thus, according to claim 25, for the four consecutive passes, the phase shift of the printhead carrier disturbance is 0 for the first pass, ½ for the second pass, ¼ for the third pass, and ¾ for the fourth pass.

Miquel and Kanemitsu, taken alone or in combination, clearly do not disclose, teach, or suggest wherein for four consecutive passes of said printhead across said print medium in said first direction, said phase shift of said printhead carrier disturbance is in the order of 0, ½, ¼, and ¾, respectively, of a period of said printhead carrier disturbance, as recited in claim 25.

For example, for substantially the same reasons as set forth above with respect to claim 1, Miquel simply does not disclose, teach, or suggest a phase shift in accordance with Applicants' claimed invention, such as, selecting the first rate of acceleration and the second rate of acceleration to phase shift a printhead carrier disturbance, as recited in claim 23 from which claim 25 depends.

In addition, for substantially the same reasons as set forth above with respect to claim 24, Kanemitsu does not disclose, teach, or suggest a phase shift within the context of claims 21 and 23, from which claim 25 depends.

Further, in contrast to wherein for four consecutive passes of the printhead across the print medium in the first direction, the phase shift of the printhead carrier disturbance is in the order of 0, ½, ¼, and ¾, respectively, of a period of said printhead carrier disturbance, as recited in claim 1, Kanemitsu merely discloses an acceleration driving range of the motor for driving the carriage is set to a time equal to half the period of the carriage vibration.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit Miquel in view of Kanemitsu, taken alone or in combination, does not disclose, teach, or suggest the subject matter of claim 25. Claim 25 is thus believed allowable in its present form.

Accordingly, for at least the reasons set forth above, Applicants respectfully submit that Miquel in view of Kanemitsu, taken alone or in combination, do not disclose, teach, or suggest the subject matter of claims 24 and 25, and thus respectfully request that the rejection of claims 24 and 25 under 35 U.S.C. 103(a) be withdrawn.

For the foregoing reasons, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of the pending claims. The pending claims are therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and allowance of the claims.

In the event Applicants have overlooked the need for an extension of time, an additional extension of time, payment of fee, or additional payment of fee, Applicants hereby conditionally petition therefor and authorize that any charges be made to Deposit Account No. 20-0095, TAYLOR & AUST, P.C.

Should any question concerning any of the foregoing arise, the Examiner is invited to telephone the undersigned at (317) 894-0801.

Respectfully submitted,

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